

We have read some of the chapters with considerable interest and pleasure, notably those which deal with the phenols and with the carbohydrates, the subjects of which are carefully and fully dealt with. In some parts of the book, however, the explanations are not so clear as we could have wished, the reactions being given with little or no attempt at an explanation. Now the average student requires a considerable amount of explanation in order that he may understand the subject. As an example of want of clearness we think it would have been wise to give some explanation of the probable mechanism of the process involved in the preparation of benzaldehyde by the action of metallic nitrates on benzyl chloride, and some explanation of Reimer's reaction would not have been out of place.

The book is well printed, and the proofs have evidently been very carefully corrected. Taken as a whole, we consider Dr. Cohen's book a very useful compilation; from the preface we had expected to find a book written on new and original lines; in this, however, we were disappointed. F. M. P.

Nature Studies (Plant Life). By G. F. Scott Elliot. Pp. viii + 352. (London: Blackie and Son, Ltd., 1903.) Price 3s. 6d.

It is not evident whether the author intends this book as a contribution to the subject of "nature-study," which is now attracting so much attention. Certainly the first and most essential feature of nature-study, namely, personal observation, is not emphasised, nor is the discursive style which the author adopts calculated to induce careful and accurate investigation. A large mass of information has been brought together, compiled from books on bionomics and original papers. The book begins with the flower and fruit, and the vegetative portions follow, an arrangement which has its advantages since morphology is sacrificed to bionomics. The relations between animals and plants are well brought out, but less prominently so the relations between plants *inter se*. The study of plant associations begins with the Cryptogams, and here, as indeed in most of the chapters, the matter is too fragmentary; only occasionally, as, for instance, in the chapters on seaweeds, or when describing the lichens, does Mr. Scott Elliot take the necessary space to do justice to himself and his subject. The concluding chapters dealing with the origin and development of the English flora introduce a subject which is well worth studying.

Das Objectiv im Dienste der Photographie. By Dr. E. Holm. Pp. xvi + 142. (Berlin: Gustav Schmidt, 1902.) Price 2 marks.

THOSE photographers, whether professional or amateur, who are able to read German will find this book full of useful information and valuable hints regarding the properties and use of the photographic objective. So numerous, so varied in construction, and so different in price are lenses of to-day that it is important that the photographer should know something of their nature and capabilities before investing in one or more of them. The present book is intended to give the reader a good all-round idea of not only the properties of lenses, their errors, corrections, the different kinds available, and hints on choosing them, but also how to use them when obtained. Although the text quite fulfils this object, the very excellent set of reproductions illustrating all the kinds of results which accrue from good or bad focusing, setting, choice of position, &c., adds greatly to its value, and demonstrates better than any words could do the points to be observed. The telephotographic lens is also included in these pages, and the book concludes with quite a full index.

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LETTERS TO THE EDITOR.

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Permanent Electric Vibrations.

IN his "Electric Waves" (see p. 361) Mr. Macdonald considers that electric waves may be propagated round a ring without being subject to any loss by radiation. The question whether this is possible is of great interest, as such waves might play an important part in atomic phenomena. It seems, however, that such waves cannot exist, except possibly in exceptional cases. For consider a spherical surface to be drawn enclosing the whole of the vibrating system. The electric force cannot vanish at all points of this surface, for the sphere may be as close to the conductors as we please. From the value of the force, and the condition that at infinity any motion that there may be must consist of outwardly progressing waves, we can find by spherical harmonic analysis the field at any point outside the sphere. The result is that in any case the field cannot at all distant points be of an order lower than that of $1/r$; there must be loss of energy by radiation. For a thin circular wire a fundamental mode of vibration is determined, to a first approximation at least, in *Proc. Camb. Phil. Soc.*, vol. ix. p. 326; and the case of a wave progressing round the wire can be deduced by compounding two such vibrations differing in phase. The determination of the resultant disturbance at a great distance involves Bessel's functions in general, but it can be proved without difficulty that for points on or near to the axis of the ring it consists of divergent waves. The consequent rate of loss of energy is of the order of unity, while the energy held is of the order of $\log(a/\epsilon)$, where ϵ is the radius of the wire and a that of the circle. The decrement is hence of the order of $1/\log(a/\epsilon)$, as found in the paper referred to.

On the other hand, it is hard to find a flaw in Mr. Macdonald's general reason for the absence of radiation in this case, and the possibility of non-radiating systems is suggested by the case of a uniformly and superficially charged dielectric sphere of unit specific inductive capacity. If it performs small simply periodic oscillations, each point of its surface may be treated as a Hertzian oscillator. On evaluating the external field, we find that the variable part of it is the same as if the charge were collected at the centre and multiplied by $(\sin \lambda a)/\lambda a$, where a is the radius of the sphere, and $2\pi/\lambda$ is the wave-length in free ether corresponding to the frequency of the oscillation. Hence, if this wave-length is a submultiple of the diameter of the sphere, there is no external oscillating field.

H. C. POCKLINGTON.

The Bearing of Recent Discoveries on the Physics of Taste and Smell.

ONE of the first experimental papers on the nature of the stimulus given to the organs of taste or smell by sapid or odorous substances is, I think, that by the Hon. R. Boyle ("Experiments and Observations about the Mechanical Production of Tasts (*sic*).," London, 1675), in which he puts forward a theory of irritation by particles which penetrate and irritate more or less according to their size and shape. After this a chemical theory of taste seemed to gain ground, and Graham laid down the principle that only soluble substances are sapid, and that further only crystalloid solutes are sapid (see Bain, "Senses and Intellect," 1864). Then in 1882 Sir W. Ramsay very tentatively put forward a dynamical theory from analogy with optics and sound (NATURE, xxvi. 187). He proposed that very light molecules vibrating at a high rate are inodorous, taking as the limit a molecular weight of about 30. On the other hand very heavy molecules would be odourless, because vibrating too slowly, whereas those vibrating at a rate between these limits would find the nerve-cells capable of response. Thus he accounted for the want of odour on the part of H, CH₄, O, N, H₂O, &c. Similar views were later ex-

pressed for taste and smell by Haycraft (*Proc. Roy. Soc. Edin.*, 1883-1887).

But we now know gaseous bodies ranging over the whole domain of molecular weights appropriated by odorous and sapid substances, owing to Ramsay's well-known work on He, Ne, Ar, Kr and X, and to the discovery of SO_2F_2 and SF_6 by Moissan (*Comptes rendus*, cxxx. 1900, 865 and cxxxii. 1901, 374). These last two gases are of special importance because their want of taste and odour cannot be due to the fact that we have become inured to them. The molecular weights of these bodies are respectively 4, 20, 40, 81, 127, 102 and 146, with which may be compared vanillin, with a molecular weight of 152.

It was long ago pointed out by Liebig (see Klimont, "Die Synthetischen und Isolirten Aromatica," 1899) and by Graham (see Bain, *loc. cit.*) that odorous bodies are, as a rule, readily oxidised, and the notion of the chemical origin of the senses in question is much strengthened by the fact that all the new gases above mentioned are very inert. SO_2F_2 , although soluble in ten parts of water, can only be decomposed by oxygen by sparking, and SF_6 is extraordinarily stable. It is recorded also by Graham that if an odoriferous principle is sniffed up in a current of CO_2 instead of air, the odour is much weakened.

There is another curious fact which might be accounted for by a chemical hypothesis. It has often been noticed that on purifying odorous or sapid substances, these properties tend to become less marked or to disappear. Thus acetylene, ammonia and acetamide have been described as odourless when pure, and it is said that ordinary sugar becomes less sweet the more it is purified. But it has been found in all carefully studied cases that stability increases very markedly with purity, and therefore on a chemical theory taste and smell would become correspondingly less.

In conclusion must be noted Prof. Ayrton's important contribution to this subject (Presid. Address to Section A. British Association, 1898), in which he definitely proves that the well-known metallic odours are not caused by the metals themselves (which are non-volatile), but by unstable decomposition products, probably unsaturated hydrocarbons.

Such a chemical explanation would not, of course, upset the vibration theory of Ramsay, but would merely mean that instead of these senses being directly stimulated by the ordinary vibrations of the molecules, they are only affected by agitations accompanying chemical change.

F. SOUTHERDEN.

Technical College, Finsbury, London, E.C., March 21.

Electricity and Matter.

IN view of the suggestive close of Sir Oliver Lodge's paper as given in *NATURE* of March 12, these more than century-old speculations of S. T. Coleridge may be found interesting.

E. H.

"But properties are God: the naked mass
(If mass, there be, fantastic guess or ghost)
Acts only by its inactivity.
Here we pause humbly. Others bolder think
That as one body seems the aggregate
Of atoms numberless, each organized;
So by a strange and dim similitude
Infinite myriads of self-conscious minds
Are one all-conscious Spirit, which informs
With absolute ubiquity of thought
(His one eternal self-affirming act!)
All his involved Monads, that yet seem
With various province and apt agency
Each to pursue its own self-centring end.

(From "The Destiny of Nations—A Vision," Juvenile Poems, S. T. Coleridge.)

Papaw-Trees and Mosquitoes.

Re Prof. Percy Groom's letter in *NATURE* (January 22, p. 271), I may mention that in Ceylon the papaw-tree gives no immunity against mosquitoes. In my garden here we usually take our afternoon tea under the shade of an old and much-branched example of the common papaw (*Carica papaya*), but far from being protected from mosquito bites in that situation, we are always terribly molested by the small striped mosquito (*Stegomyia scutellaris*). The stem of this tree is also haunted by various spiders and flies. I

have not sufficiently studied the tree during the sunny part of the day to say whether flies settle on the leaves or not, but I propose to pay attention to this question shortly.

E. ERNEST GREEN.

Royal Botanic Gardens, Peradeniya, Ceylon, February 26.

A Remarkable Meteor.

WITH reference to the meteor a letter of mine concerning which you printed in your last issue (p. 464), I have received some details from Mr. G. S. Russell, of West Norwood, who saw it from the neighbourhood of the Crystal Palace. From the facts that he saw it E.N.E. (as I did) and saw the "wobbling" close to earth, it is seen that the meteor must have been a great distance off, probably falling a considerable distance out in the North Sea. He is convinced that it reached the earth's surface. Its great distance off would account for its apparently very slow movement. Owing to the steadiness of both its brilliancy and velocity it was probably of great size.

J. E. C. LIDDLE.

Fairfields, Basingstoke, Hants, March 23.

THE MOVEMENT OF AIR STUDIED BY CHRONOPHOTOGRAPHY.

THE investigation of stream lines has occupied the minds of several powerful workers, and great results have been obtained by the late W. Froude and Prof. O. Reynolds, and recently Prof. Hele Shaw has added some striking illustrations of the paths of the flow of liquids. Borda, in an almost forgotten, but remarkable paper (*Memoires de l'Académie Royal*, 1766), writes thus (when describing the conditions under which water flows by an opposing object):—"On imagine ensuit que les molécules du fluid, en s'approchant du corps, décrivent des lignes courbes, ou plutôt se meuvent dans les *petits canaux courbes*." Borda goes on to show that theoretically the stream lines should flow round and again join in the rear of the object.

Thus the idea of stream lines and their behaviour was regarded as a matter of interest at an early date.

In a recent paper, in the *Bulletin des Séances de la Société Française de Physique*, 1902, M. Marey has added fresh information respecting the form of stream-lines, and by his new experimental methods he shows how air behaves as it flows by different shaped objects. In the first place he draws attention to his experiments on the movements of liquids in which he employed a stream of water, holding in suspension shining pearls of the same density as water; these were brightly illuminated by sunlight, a dark background being placed behind them; by means of a chronophotographic apparatus, a series of pictures of the illuminated parts was taken, their appearance in the picture being that of dotted lines. The direction and speed of the current which carried them along was by this means found.

When obstacles of different shapes were placed in the current the stream lines of the liquid were seen to bend in different ways and to form eddies. For example, in the case of water impinging against an inclined plane, the streams of liquid divide at a point, which appears to be the centre of pressure. In each case eddies form in the rear of the obstacle. The speed of the fluid, at any moment, could be recognised on the photograms by the degree of separation of the shining pearls, for photographed as they were, at equal times, they covered different distances in these equal intervals of time. A divided scale gave the lengths of these distances covered, while the rate of taking the successive pictures (ten per second) gave the speed of the current in its various positions.

By means of a method similar to this the direction and speed of the streams which form in a current of